[0035] The various codes **106** are then used to modulate or otherwise create the particular modulation signals **110**A-D that are applied to the various sensing electrodes **112**A-D in sensing region **101** (step **202**). As described above, the applied signals are electrically affected by the presence of object **121**, with the resultant electrical effects being determinable from received signal **116** (step **203**).

[0036] Demodulating received signal channels **113** (in step **204**) suitably involves extracting information about the position of object **121** from the modulated signals. Such extraction typically involves reversing the modulation process described above. Accordingly, demodulator **117** typically receives carrier signal **111** (or another signal that is synchronous with signal **111**) for performing analog demodulation and/or signal discrimination (e.g. distinguishing between noise and desired signal) in addition to the particular digital code **106** that previously modulated the carrier signal used to create the particular resultant signal **116**. Because the sensor both transmits and receives, it is rarely necessary to recover the carrier or code sequence.

[0037] Demodulation may be carried out for any number of received signal channels **113**, as appropriate (step **206**). In the exemplary sensor **100** shown in FIG. **1**A, signal **116** resulting from the transmission of each signal channel from the modulated electrodes **112**A-D are received on a common path emanating from receiving electrode **114**. Even if the various sensing channels **113**A-D are all active at the same time (e.g. modulation signals **110**A-D are simultaneously provided to each modulated electrode **112**A-D), however, the resulting signals **116** produced by each channel **113**A-D can be demodulated using conventional CDM demodulation techniques. Particular components (or channels) of resultant signal **116** produced in response to any modulation signal **110**A-D can therefore be readily extracted. This concept can be exploited in myriad ways, as described below, to create a number of additional features and performance enhancements within sensor **100**. A common modulation signal **110**A-D, for example, could be applied to multiple electrodes **112**A-D to increase the size of any particular sensing zone within region **101**. These zones can be readily adjusted during operation to create various operating modes or the like. To make the entire sensing region **101** act as a single button, for example, each electrode **112**A-D could be provided with the same modulation signal **110** without otherwise adjusting the performance of the sensor. Because all of the signals resulting from receive electrode **116** are provided on a common path in FIG. **1**, simply demodulating the entire received signal using the common modulation code will identify the presence of object **121** anywhere within sensing region **101** in this case. Similar concepts can be applied to create any number of independent or overlapping sensing zones across sensing region **101** through simple manipulation of digital code sequences **106**. Furthermore, spatial frequency filtering can be done simply through proper modulation and demodulation, for example to accomplish palm rejection or to reject other inappropriate inputs.

[0038] The demodulated signals **118** are appropriately received at controller **102** so that the position-based attribute of object **121** can be determined (step **208**). These signals may be filtered digitally or as analog, using linear and non-linear filters. Various techniques for identifing the position of object **121** with respect to the various electrodes **112**A-D include detection of peak electrical effect, computation of a centroid based upon the electrical effects, comparison of differences in electrical effects observed between electrodes **112**A-D, comparison of changes in electrical effects over time, interpolation between signal channels from the electrodes, and/or according to many other techniques. In the case of peak detection, the position of object **121** is associated with one or more electrodes **112**A-D by identifying which modulation signal **110**A-D produced the greatest relative change of capacitive effect in resultant signal **116**. Sensing channels **113**A-D experiencing such peak (maximum, minimum, or otherwise distinct) electrical effects could also be identified by comparing currently-observed, scaled electrical effects to baseline values (e.g. average values for the particular channel that are empirically determined, averaged over time, stored from a previous observation, and/or the like). Still other embodiments could identify the channel **113**A-D that produced peak electrical effects by comparing current electrical effects for each channel **113**A-D with current values observed in neighboring sensing channels. Alternatively, a weighted average of the electrical effects observed from some or all of the modulated electrodes **112**A-D can be computed, with this weighted average, or centroid, correlating to the position of object **121**. Many techniques for correlating electrical effects observed across sensing region **101** to a position of object **121** are known or may be subsequently developed, and any of these techniques may be used in various embodiments, according to the application.

[0039] By varying the digital codes **106** used to create modulation signals **110**A-D over time, various additional features can be implemented. To implement a simple dual-differential digital-to-analog conversion for received signal channels **113**, for example, the digital code **106** applied to one or more electrodes **112** is logically inverted (e.g. 1's complement) on a periodic, aperiodic, or other time basis to obtain complementary sensed signals **116**. The complementary codes **106** can be used to drive two separate ADC inputs (e.g. ADCs present in driver **115** and/or demodulator **117**) in opposite directions, thereby canceling out many types of variability or residual distortion in signal **116**. Steps **210** and **212** describe optional noise reconfiguration and image processing features, respectively, that may be enabled in various embodiments as additional benefits available from the use of spread spectrum techniques. These features are described in increasing detail below (in conjunction with FIGS. **3** and **4**, respectively), and may not be present within all embodiments. Because the digital codes **106** are inherently simple to modify, store and subsequently process, any number of signal enhancement, noise reduction and/or other performance improvements to sensor **100** are enabled. Further, a relatively large number of digital codes are available due to the combinatorial power of digital sequences. Coding gain and orthogonality conventionally rely upon linearity and superposition of the particular codes used. Although non-linearity and dispersion limit the theoretical effectiveness of digital codes, these limitations can be more than offset by the increases in relative signal power (and thus SNR) that can result from simultaneously modulating more than one electrode **112**. Further, since it is possible that self-induced inter-channel noise dominates over other noise sources in many embodiments, a relatively stable dynamic range can be provided.

[0040] Referring now to FIGS. **3**A-B, spread spectrum techniques allow for improved noise avoidance as compared